

EXERCISES FOR SECTION 4.5

In Exercises 1–6, complete the table by identifying u and du for the integral.

$\int f(g(x))g'(x) dx$	$u = g(x)$	$du = g'(x) dx$
1. $\int (5x^2 + 1)^2(10x) dx$		
2. $\int x^2 \sqrt{x^3 + 1} dx$		
3. $\int \frac{x}{\sqrt{x^2 + 1}} dx$		
4. $\int \sec 2x \tan 2x dx$		
5. $\int \tan^2 x \sec^2 x dx$		
6. $\int \frac{\cos x}{\sin^2 x} dx$		

In Exercises 7–34, find the indefinite integral and check the result by differentiation.

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|---|---|
| 7. $\int (1 + 2x)^4(2) dx$ | 8. $\int (x^2 - 9)^3(2x) dx$ |
| 9. $\int \sqrt{9 - x^2}(-2x) dx$ | 10. $\int \sqrt[3]{1 - 2x^2}(-4x) dx$ |
| 11. $\int x^3(x^4 + 3)^2 dx$ | 12. $\int x^2(x^3 + 5)^4 dx$ |
| 13. $\int x^2(x^3 - 1)^4 dx$ | 14. $\int x(4x^2 + 3)^3 dx$ |
| 15. $\int t\sqrt{t^2 + 2} dt$ | 16. $\int t^3\sqrt{t^4 + 5} dt$ |
| 17. $\int 5x\sqrt[3]{1 - x^2} dx$ | 18. $\int u^2\sqrt{u^3 + 2} du$ |
| 19. $\int \frac{x}{(1 - x^2)^3} dx$ | 20. $\int \frac{x^3}{(1 + x^4)^2} dx$ |
| 21. $\int \frac{x^2}{(1 + x^3)^2} dx$ | 22. $\int \frac{x^2}{(16 - x^3)^2} dx$ |
| 23. $\int \frac{x}{\sqrt{1 - x^2}} dx$ | 24. $\int \frac{x^3}{\sqrt{1 + x^4}} dx$ |
| 25. $\int \left(1 + \frac{1}{t}\right)^3 \left(\frac{1}{t^2}\right) dt$ | 26. $\int \left[x^2 + \frac{1}{(3x)^2}\right] dx$ |
| 27. $\int \frac{1}{\sqrt{2x}} dx$ | 28. $\int \frac{1}{2\sqrt{x}} dx$ |
| 29. $\int \frac{x^2 + 3x + 7}{\sqrt{x}} dx$ | 30. $\int \frac{t + 2t^2}{\sqrt{t}} dt$ |
| 31. $\int t^2 \left(t - \frac{2}{t}\right) dt$ | 32. $\int \left(\frac{t^3}{3} + \frac{1}{4t^2}\right) dt$ |
| 33. $\int (9 - y)\sqrt{y} dy$ | 34. $\int 2\pi y(8 - y^{3/2}) dy$ |

In Exercises 35–38, solve the differential equation.

35. $\frac{dy}{dx} = 4x + \frac{4x}{\sqrt{16 - x^2}}$

36. $\frac{dy}{dx} = \frac{10x^2}{\sqrt{1 + x^3}}$

37. $\frac{dy}{dx} = \frac{x + 1}{(x^2 + 2x - 3)^2}$

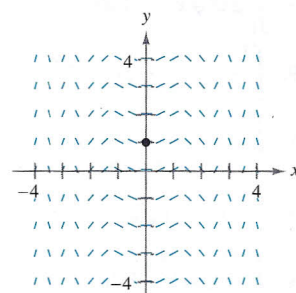
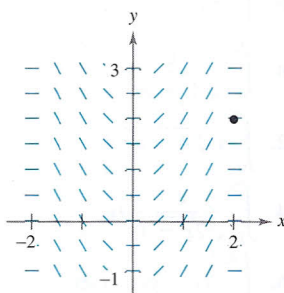
38. $\frac{dy}{dx} = \frac{x - 4}{\sqrt{x^2 - 8x + 1}}$



Slope Fields In Exercises 39 and 40, a differential equation, a point, and a slope field are given. A *slope field* consists of line segments with slopes given by the differential equation. These line segments give a visual perspective of the directions of the solutions of the differential equation. (a) Sketch two approximate solutions of the differential equation on the slope field, one of which passes through the indicated point. (To print an enlarged copy of the graph, go to the website www.mathgraphs.com.) (b) Use integration to find the particular solution of the differential equation and use a graphing utility to graph the solution. Compare the result with the sketches in part (a).

39. $\frac{dy}{dx} = x\sqrt{4 - x^2}$, $(2, 2)$

40. $\frac{dy}{dx} = x \cos x^2$, $(0, 1)$



In Exercises 41–54, find the indefinite integral.

41. $\int \pi \sin \pi x dx$

42. $\int 4x^3 \sin x^4 dx$

43. $\int \sin 2x dx$

44. $\int \cos 6x dx$

45. $\int \frac{1}{\theta^2} \cos \frac{1}{\theta} d\theta$

46. $\int x \sin x^2 dx$

47. $\int \sin 2x \cos 2x dx$

48. $\int \sec(1 - x) \tan(1 - x) dx$

49. $\int \tan^4 x \sec^2 x dx$

50. $\int \sqrt{\tan x} \sec^2 x dx$

51. $\int \frac{\csc^2 x}{\cot^3 x} dx$

52. $\int \frac{\sin x}{\cos^3 x} dx$

53. $\int \cot^2 x dx$

54. $\int \csc^2\left(\frac{x}{2}\right) dx$